

Enfield Grevillea - optimal fire regimes: pre- and post-burn monitoring

A joint project between Arthur Rylah Institute for Environmental Research and Grampians Region Bushfire and Forest Services Division

Project Update, June 2024

Key Messages

- Objective to investigate the optimal fire regimes to support the persistence of Enfield Grevillea populations.
- Results from pre- and post-burn monitoring of burnt and control plots found that larger plants produce more seed, and that plants regenerate from both lignotubers and seed.
- Monitoring needs to continue for 5-10 years to understand fire intervals required for reproductive maturity.

Project Background

Biology and threats

Enfield Grevillea (*Grevillea bedgoodiana*) is a low growing shrub to 0.5m high, which is endemic to a small area in the dry forests around Enfield, south of Ballarat in Victoria. Plants can re-shoot from lignotubers after fire or slashing and regenerate from soil stored seed. It is estimated that there are about 37,000 plants across 60 populations in the wild.

It is listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation* (EPBC) Act 1999, and endangered under the Victorian *Flora and Fauna Guarantee* (FFG) Act 1988. The main threats are introduction of *Phytophthora cinnamomi* (a root-rot pathogen) and inappropriate fire intervals, but little is known of its fire requirements.

Aims

We are investigating the optimal fire regimes to support the persistence of Enfield Grevillea populations. This will inform planned burning and management of the species. The specific questions are:

- (1) time after fire to reach maximum seed production
- (2) proportions of resprouting and seedling recruitment following fire
- (3) survival rates after fire for different size plants, and comparisons with unburnt plants



Monitoring methods

Permanent monitoring sites have been established, to collect information on the reproductive responses of Enfield Grevillea, and over time investigate the persistence of the species to varying fire intervals.

Four sites were set up in Enfield State Park (in an area between Colac-Ballarat Rd, Misery Creek Rd and Halls Rd). Within each site there is a 10m x 10m 'control' plot (unburnt) and a 10m x 10m 'impact' plot (burnt).

Pre-burn data were collected at the four sites in early December 2021. Thirty adult grevilleas of varying sizes within each plot were selected and marked with metal pegs and tags (240 plants in total). The following measurements were made on each plant: plant diameter; lignotuber diameter; number and length of live stems; number of seedpods.

A low-intensity burn was applied to the four 'impact' plots in April 2023, and post-burn data collected in late November 2023. For the 30 tagged adult grevilleas within each plot, the following measurements were made: burnt/unburnt status; mortality/resprouting; plant diameter. Within each 10 m x 10 m plot, counts were made of the number of seedlings that germinated after the fire, as well as any that germinated without fire.



Impact plot 2021 (pre-burn) – Wattle Creek Tk



Impact plot 2023 (post-burn) – Wattle Creek Tk



Control plot 2021 – Wattle Creek Tk



Control plot 2023 – Wattle Creek Tk

Results

Plant size and seedpod production

Data were analysed using statistical models. There was evidence that larger plants are both more likely to have seed and to have more seedpods per plant.

For example, plants that are 35cm in diameter have a 75% chance of being immature (no seed pods), and plants over 100cm are very likely to be mature. For every additional mm in lignotuber diameter, plants are predicted to have a 5% increase in seedpods (95% CI: 3%-6%).

Older plants have larger lignotubers, but it is difficult to relate plant size to age and hence time since fire, because of sporadic seedling recruitment between fires.



Seed pods (left) and lignotuber (right) of mature plants



Seedling and resprouting plants after burning

Seedlings after fire

There was strong evidence that the number of seedlings were greater in burnt compared to unburnt plots, indicating fire is beneficial for recruitment.

The estimated average number of seedlings in burnt plots were 51.6 (95% CI: 33.6-73.1) compared to 2.4 (95% CI: 0.9-4.4) in unburnt plots.

Plant survival after low severity fire

We observed many plants resprouting after low severity fire, confirming previous observations that Enfield Grevillea generally survives fire.

Although there was slightly higher mortality for burnt plants (30 of 112 plants) compared to unburnt plants (10 of 128 plants), the sample size was inadequate to provide evidence for increased mortality due to low severity burning. There was also insufficient data to show increased mortality for smaller plants.

Conclusions and implications

Fire planning

Currently, a conservative approach to burn planning is taken by DEECA, with fire excluded from known Enfield Grevillea populations that are less than ten years old. The interim results of this project do not provide sufficient information to alter this approach. Other considerations are to avoid burning adjacent patches of Enfield Grevillea within a few years, and avoiding planned burns during periods of drought, to reduce plant mortality.

Future monitoring

Post-burn monitoring of the experimental plots will need to be carried out in two, five and ten years' time, in order to inform suitable fire intervals for the persistence of Enfield Grevillea populations. This includes measurement of seed production and survival rates for both resprouting and seedling plants.



Phytophthora management

It is essential to continue to follow strict hygiene protocols for cleaning boots, equipment and tools when working in the Enfield Grevillea monitoring sites, to prevent the introduction and spread of Phytophthora.

Stakeholders

Collaboration with interested volunteer groups has contributed to the success of the project. Continued communication will help maintain interest in assisting with monitoring of Enfield Grevillea into the future.

Further reading

Carter, O., Murphy, A. and Downe, J. (2006). National Recovery plan for Enfield Grevillea (*Grevillea bedgoodiana*). Department of Sustainability and Environment, Victoria.

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We acknowledge Victorian Traditional Owners and their Elders past and present as the original custodians of Victoria's land and waters and commit to genuinely partnering with them and Victoria's Aboriginal community to progress their aspirations.



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